

LAUREATES LUNCHEON

October 14, 2005 - Noon - 2:00 p.m.

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Bringing The Blue Revolution to the Poor

Today we live in a world where poverty and hunger are still prevalent. In spite of the Millennium Development Goals to reduce the hungry and malnourished population by half by 2015, hunger and malnutrition still remain the most devastating problems facing the world's poor. Tragically, nutrient deficiencies in one form or another are affecting a considerable portion of the global population. This remains a continuing travesty of the recognized fundamental human right to adequate food, freedom from hunger and malnutrition, particularly in a world that has both the resources and knowledge to end the catastrophe.

Looking back to the days when I joined the fisheries in India in the early 1960s, I was an object of pity, as people of my community and friends thought I joined the fisheries because I could not get a job. That was the status of fish and fisheries at that time, especially in India where more than 50% of the population is vegetarian. I for myself did not think at that time that fisheries and aquaculture would receive this much attention and I would be here to receive this award.

Today fish is the most internationally traded commodity. It is estimated that global trade in fish is around \$60 billion a year. The export of fish and fish products from developing countries exceeds those from meat, dairy, cereals, sugar, coffee, tobacco and all seeds. Over 40% of global fish production is traded across countries, as compared to only 10% in the case of the meat. This is astonishing for a perishable commodity like fish and points to the increasing demand and changes in human diet globally.

A number of speakers in this symposium have stressed the need for a balanced diet. Fish are rich source of protein, essential fatty acids, vitamins and minerals. Fish have a highly desirable nutrient profile, providing an excellent source of high-quality animal protein that is easily digestible and contains vitamins A, B, E and selenium. The fats and fatty acids in fish, particularly the long chain n-3 fatty acids (n-3 PUFA), are highly beneficial and difficult to obtain from other food sources. Fish are also rich in many minerals like calcium, phosphorous, iodine, selenium and iodine in marine products.

Fish is a major source of animal protein to people in developing countries. Probably people sitting here may not understand how important fish is to the people in the developing countries in Asia, Pacific and Africa, especially to the rural poor, contributing as much as 60 to 80% of the animal protein intake. Statistics indicate that the per capita consumption of fish globally has increased from 4 kg in 1973 to 16 kg now. These statistics mask the true picture that exists on the

ground at national level. For example, in Sub-saharan Africa, per capita consumption has gone down from 9 kg to 6.6 kg during the period referred to earlier

In addition to contributing to the nutrient security, the sector has also been providing employment to 200 million directly and over one billion when support sector is included. Also the sector has been contributing to the economies of the developing countries in terms of foreign exchange earnings. For example, from a small country like Vietnam aquatic products worth \$2.5 billion dollars are exported annually. This means the earnings from the fish exports are being used for import of other agricultural commodities.

It has been estimated by the WorldFish Center and International Food Policy Research Institute that by year 2020 an additional 40 million tons of fish will be needed as against present production of 104 million tons of food fish to meet the demand of growing population, changing dietary habits and improved economic situation. Much of this demand for this increase will be in developing countries. Available information indicates that many natural (wild) fish populations have been fully exploited or over exploited and will not be able to contribute to additional production.

Studies undertaken by the WorldFish Center recently in nine countries of Asia indicated that inshore populations have declined to 10 to 30% of what they were in 1970s. So if we do not act now to protect these resources, probably the future generations will have to see the fish in the museums.

Warren Evens of the World Bank at the recently held Fish For All Summit in Nigeria said, "We are on the brink of a crisis; seven top commercial species have been over-exploited." The World Summit on Sustainable Development (WSSD) suggested restoring the depleted stocks to the original status by year 2015, which I think is a tall order and not achievable, given the ground realities. Hence, it has become a challenge for the world to increase production through aquaculture to meet the growing demand.

Increased production does not necessarily lead to food security. What is needed is access to food for the poor. For agricultural production to not only increase but be sustainable and contribute to nutritional security and livelihood of poor, a number of challenges need to be addressed.

Ninety percent of global agricultural production comes from Asia where rural farmers constitute over 60 to 80% of the population. All the statistics I mentioned earlier does not mean much to the poor households who are the major consumers of fish, unless the issue of lack of access to resources - both natural and financial, lack of skills, vulnerability and aversion to risks are addressed. These are the challenges that need to be addressed by all of us if poverty and malnutrition in developing countries are to be reversed through opening livelihood opportunities. This would mean understanding contextual circumstances, operating environments and the conditions that enable the poor to take advantage of the opportunities.

In this context, I would like to take the opportunity to briefly mention some of the challenges that we have to address, and I have been addressing in some of my work in the last three decades.

The first challenge is to make science relevant to the needs of the farming community. I will take two examples of my work in India in 1970s and the work in Bangladesh in 1980s. I started my

research in fisheries in early 1960s when there was no realization in India of the importance of aquaculture. So I was asked to do the research on management of capture or wild fisheries. But realization came in 1970s that if the demand for fish has to be met, we should not depend only on the capture fisheries or wild stocks, but have to go for aquaculture. So in 1971, I was asked to shift from management of wild fisheries to aquaculture research. By that time my colleagues in India had undertaken research and developed a technology that can give a production of three tons per hectare per year on experimental farms as against national average production of 800 kg per hectare. But the technology wasn't adopted by the farming community. They thought these technologies were developed at research institute under ideal conditions, and they may not be relevant to the farming conditions that they have and also not financially viable.

So under a program that was initiated by Professor M.S. Swaminathan, the first recipient of the World Food Prize, I was asked to take the technology to the field and adapt to the prevailing agro-ecological conditions. That was my first exposure to aquaculture. Before that I did not have any experience in aquaculture.

So the first task I took was to go to the communities and development agencies, see the resources they have - the natural resources, the financial resources and human resources and understand what their constraints are and what potentials are there in the field. From there, we started modifying the technologies in consultation with the farming communities. And to the surprise of everyone, in the first year itself the productions were five to six tons per hectare under farmers' conditions as against three tons per hectare obtained under experimental conditions.

This was the beginning of aquaculture development in India. From a production of about 75,000 tons from aquaculture in 1970s, India now produces over two million tons of fish per year. At that time we didn't call it the Blue Revolution. We called it as "Aquaplosion".

The second example I would like to give you is the case from Bangladesh where I was working with FAO and also the World Fish Center. When I went there in 1986, I saw plenty of water because nearly two thirds of the country goes underwater for three to five months a year, as it's a low-lying area. There is plenty of water, but if we look at the fish, hardly any fish is there. The fish prices are very high, and the people are not able to get enough fish.

So I was wondering – if there is so much water, which is basic requirement for fish, how is that there is not much fish? There are nearly five million ponds, out of which over 500,000 to 600,000 are small, homestead ponds which retain water only three to five months a year. And they were filled with aquatic weeds and formed the breeding ground for mosquitoes and creating a health hazard. I asked my colleagues – “why are not you doing fish culture? here we have excellent opportunity?”. They said, “well, we have tried the culture of traditional carps, but the fish did not grow as the waters are turbid and shallow, so we gave up”. I said, “We should not give up. You have tried only three species of fish. There are more than 240 species of fish that are suitable for aquaculture. Let us find out which species could be suitable.”

So we started experimenting, and finally we found two species which could grow under turbid and shallow water conditions and reach market size in three to five months' time. They were tilapia and one other carp called “silver barb”. They were reaching about 150 to 200 grams in about five months' time. There was a demand for the fish in the market, and the people were able to get about one to two tons per hectare in short time of 3-5 months. So this has revolutionized the

fish culture in Bangladesh. Now, Bangladesh produces about 850,000 tons of fish from aquaculture as compared with about 170,000 tons when the research started in 1986.

The second challenge I see is aquaculture in the context of rural development. If we are talking of small scale aquaculture to benefit rural farmers and increase production, we have to think of aquaculture in the context of rural development, not as a standalone activity and incorporate it with other farming activities. Systems developed in Asia are now being tried in Africa for integrating aquaculture with crop farming and livestock farming, has resulted in increased incomes to households, diversification of crops, less risk and environmentally friendly, as it resulted in less or no use of pesticide and weedicides in rice farming.

For example, some of the work that we did in Asia of integrating aquaculture with rice farming showed that farmers are not only able to increase the benefits but also the rice production for some reason has gone up by 9 to 11% by including the fish. Also farmers are not using the pesticides as they're afraid if they use the pesticide, the fish might die. When we had this integrated pest management (IPM), the extension agents were going to the farmers and telling, "don't use the pesticides, follow the IPM, it'll be all right and the crops will not be damaged", but farmers didn't want to take the risk, so they were still using the pesticides. But when we put the fish into the rice field, they were thinking twice to put the pesticide as that would kill the fish. So integration of aquaculture indirectly helped in introducing IPM..

The third challenge is access to resources. According to FAO and ILO that came up with a report very recently, out of 1.1 billion people involved in agriculture globally, 450 million work as laborers earning less than a dollar a day. Of estimated 246 million children who go to work globally, over 170 million, or 70%, are employed in agriculture. Each year 22,000 children are killed on jobs, many in agriculture. Are we going to continue the status like this, or are we going to do something for that? So we, the scientists, the planners, the administrators, the development agencies should take some action to reverse the situation.

In this context, I'll take an example of how we tried to involve the landless rural communities and benefit them through aquaculture. While working in Bangladesh we saw large number of public and private sector water bodies which are not being used for aquaculture. With the cooperation of the non-government organizations (NGOs), small groups of each five to ten landless people were formed and they were motivated and trained by NGOs, and the public sector water bodies and the private water bodies which are not being used were leased to these landless groups. And that was again a success. And now it's continued and other countries are trying to follow suit.

The fourth challenge as I see is the importance of women in aquaculture. Realizing that... women are confined to their homes and have no or few means of income in countries such as Bangladesh, we tried to see whether the women could be involved in aquaculture operations. The low-cost, low-input, high-output aquaculture technologies that have been developed through on-farm research, are suitable for the women, as the ponds are situated near to their homesteads. So we motivated the groups of women, trained them, and NGOs came forward to give them micro-credit, and they started fish culture.

Again, it was a grand success. Now, nearly 60% of the fish farmers in Bangladesh are women. So this has resulted not only in increasing the fish production but also increasing income for the

households, increase in nutrition, and important of all, importance of the woman. Before that, the women didn't have a status within their families or in the society. Now women have become earning members of the family. Some women told me, "Earlier my husband used to beat me. Now he cannot dare to do that, because I earn more than him." So adoption of aquaculture has resulted in empowerment of women.

The result of all these activities – in Bangladesh rural economy, fish has become indispensable in the context of household food security, employment and income for the poor. When we started working with the communities, it was our understanding that the fish produced will be consumed by the households. However, in reality, the farmers were consuming only about 20% of the production and were selling 80% of the production to generate cash income. They were selling high value species they were culturing and buying cheaper, dry fish and other household needs.

The fifth challenge as I see it – the need for better breeds of fish. If we talk of the Green Revolution, the father of the Green Revolution Dr. Norman Borlaug is here, it is because of the Green Revolution technologies - genetic enhancement and hybridization of the strains that saved millions from starvation. But if we look at the case of the fish, there is not much of a domestication, and most of the species that we presently use in Asia and Africa for culture are worse than their cousins in the wild, because of continuous in-breeding in the hatcheries. So the World Fish Center started developing methods for genetic enhancement of fish in late 1980s and '90s, and this has resulted in developing methods for genetic enhancement of tropical fish using Nile tilapia as a test species. The improved Nile tilapia, which is native to Africa, is showing about 85% faster growth after five generations of selective breeding as compared with base population. This genetic enhancement methods is being presently utilized for other major species in aquaculture such as carps which contribute more than 60% to the global aquaculture production. Already some species in different countries of Asia, after three generations of selective breeding are showing over 30% increased growth.

The other challenge is keeping environment in good condition. After the announcement of the award, I was going through the internet and in one of the sites where this announcement was made, somebody commented, "Oh, another blow to environment." They thought fish culture always results in degradation of environment. Of course, there is some truth in that - in the early stages of shrimp culture, mangroves were destroyed in many countries. But people are realizing the mistakes they have made and taking corrective measures. Shrimp is only miniscule of the total global agricultural production we are talking about.

The other challenging area is developing partnerships between public and private sector, learning the lessons from the crops and livestock sector. If we look at the crop sector, seed production is completely in the hands of private sector which has come up very well. But in the case of fish, we are still to develop to that level.. So there is a potential to develop the partnership between public and private sector.

Lastly, let us look at the policy atmosphere... In most countries policies are in place for aquaculture development. But what is lacking to make the technologies work for the poor are the strategies, development plans and allocation of adequate resources, both human and financial. What is needed is the willpower of governments to implement policies and strategies for increasing fish production for meeting the increasing demand. In an era of globalization and

trade liberalization, approaches should also focus on producing a product that is affordable, acceptable and accessible to all sectors of the society.

We are in the beginning of the Blue Revolution, but much more needs to be done for the needy to take advantage of the science. Let us hope and all of us join our hands to make it a success.

In closing, though I have received this award, I still feel sad somewhat. I was able to convince a million families to take to aquaculture, but I could not convince my wife of 40 years and my brother of 60 years who are here to eat fish. But I am not giving up. I'm still trying. I think I'll succeed one day.

Thank you very much.